

## SECTION 11. SUMMARY AND POSITION OF THE SERVICE

Bogue Banks is a complex barrier island composed of old beach ridges and dune fields (Moslow and Heron 1994; Riggs 2002). The island is not dominated by overwash processes, having some of the highest interior elevations of any North Carolina barrier islands instead. The maritime forest and freshwater wetland communities within this high dune ridge and swale topography are of high value (resource category of 2) to fish and wildlife resources. The estuarine shoreline and Bogue Sound also provide high value (resource category of 2) to fish, shellfish, and wildlife resources in the project area, containing waters designated as ORW in the western portion of Bogue Sound and as a HAPC throughout the sound. Bogue Inlet to the west is of high value (resource category of 2) due to its scarcity as a comparably undisturbed tidal inlet in North Carolina. Beaufort Inlet to the east of the island is disturbed by a deep navigational channel and regular maintenance dredging, reducing its value to a more abundant, high to medium value (resource category of 3) to fish and wildlife resources. The nearshore and offshore marine areas are of high value (resource category of 2) to commercially and recreationally important fisheries, hardbottoms, artificial reefs, marine mammals, sea turtles and a productive benthic community.

A dredge and fill project to stabilize the oceanfront shoreline of Bogue Banks is more likely to be successful than for most other locations in North Carolina. The habitat value of the potential beach fill area is medium to low (resource category of 4), and several dredge and fill projects are occurring already. Relatively low erosion rates and high island elevation create a more durable system for beach nourishment than other low-lying, overwash-dominated barrier islands in the state.

Although adverse environmental impacts can result from dredge and fill projects, many of these impacts can be avoided and minimized. Conducting the dredge and fill activities during the period of lowest biological productivity (December to March 1), avoiding biologically productive inlet shoulders and previously undisturbed seabeds, utilizing a design template that capitalizes on natural aeolian and vegetative processes to restore foredune habitats, and potentially recycling ecologically compatible sediments from the nearshore and offshore disposal sites are all conservation measures that would avoid and minimize environmental impacts.

For those impacts that cannot be avoided, mitigation measures are available to offset those impacts. Reductions in biological productivity resulting from increases in turbidity during the dredge, fill and fill reworking processes can be offset by a mitigation project elsewhere in Carteret County such as oyster reef restoration. Reductions in habitat value for nesting birds and sea turtles can be offset by restricting beach driving to the period between November 16 and March 1 when neither of these resources are nesting. Reducing the level of light reaching the beach from nearby structures during sea turtle nesting season (April 15 to November 15) will also benefit successful sea turtle nesting. Finally, a monitoring plan that includes both physical and biological parameters would evaluate the success of avoidance and minimization measures and could offset remaining uncertainties and unanticipated impacts. A project management team that includes the monitoring contractors, resource agencies, the local sponsor and the Corps could oversee the construction and operations and maintenance of the project and determine when ecological impacts are no longer anticipated and determine when the monitoring should be

discontinued. The team could also adaptively guide the project if unanticipated events occur (e.g., dredging tires, taking sea turtles).

Implementation of the conservation measures recommended within this report should create an ecologically sound shore protection project for Bogue Banks that avoids and minimizes damages to fish and wildlife resources. A dredge and fill project that utilizes ecologically compatible fill materials and avoids disturbing new seabeds would be the least environmentally damaging alternative and one we would support. Avoiding known fishing grounds and beach seining seasons would minimize damages to the local fishing industry, as would minimizing impacts to the prey base for those fishery resources. If these measures could be implemented, the Service would support a dredge and fill project on Bogue Banks.

## SECTION 12. LITERATURE CITED

- Alexander, R.R., R.J. Stanton and J.R. Dodd. 1993. Influence of Sediment Grain Size on the Burrowing Bivalves: *Palaios*, v. 8, pp. 289-303.
- Barnard, W.D. 1978. *Prediction and control of dredged material dispersion around dredging and open-water pipeline disposal operation*. Technical Report DS-78-13, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.
- Bent, A.C. 1964. *Life Histories of North American Petrels and Pelicans and Their Allies*. New York: Dover Publications Inc. 404 p.
- Bowman, M.L., and R. Dolan. 1985. The Relationship of *Emerita talpoida* to Beach Characteristics. *Journal of Coastal Research*. 1(2):151-163.
- Browder, A.E. 2002. Sand search and beach restoration at Pensacola Beach, Florida. *Proceedings, 15<sup>th</sup> Annual National Conference on Beach Preservation Technology*, Biloxi, MS. pp. 251-264.
- Brown, S., C. Hickey and B. Harrington (eds). 2000. *United States Shorebird Conservation Plan*. Manomet, Massachusetts: Manomet Center for Conservation Sciences. Various paginations.
- Canter, L.W., and J. Kamath. 1995. Questionnaire Checklist for Cumulative Impacts. *Environmental Impact Assessment Review*: v. 15, pp. 311-339.
- C-CORE. 1996. *Marine Mining Technologies and Mitigation Techniques. A Detailed Analysis with Respect to the Mining of Specific Offshore Mineral Commodities*. Report to the U.S. Department of the Interior, Minerals Management Service. OCS Report MMS 95-0003. 400 p.
- Coastal Science Associates, Inc. (CSAi). 2002. *Bogue Banks Beach Nourishment, Second Pre-Dredge Environmental Monitoring Study, November 2001*. Columbia, SC. 32 p. + appendices.
- Coastal Science & Engineering, LLC (CSE) and Stroud Engineering PA. 2000. *Bogue Banks Beach Restoration Plan, Environmental Impact Statement, Draft #2*. Columbia, SC. Various paginations.
- Collazo, J. 2001. Accessible habitat for shorebirds: Factors influencing its availability and conservation implications. *Proceedings of the Coastal Ecosystems and Federal Activities Technical Training Symposium*, August 20-22, 2001, Gulf Shores, Alabama. U.S. Fish and Wildlife Service, CD-ROM.
- Conaway, C.A. 2000. Aeolian dynamics and erosion mitigation at mechanically modified

- shorelines: Bogue Banks, NC. Unpublished Master's Thesis, Department of Marine Sciences, University of North Carolina at Chapel Hill. 175 p.
- Council on Environmental Quality (CEQ). 1997. *Considering Cumulative Effects Under the National Environmental Policy Act*. Washington, D.C. January 1997. 64 p. + appendices.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Department of the Interior, Fish and Wildlife Service Publication FWS/OBS-79/31. 131 p.
- CZR, Inc. 2002a. Waterbird and Shorebird Use at Ocean Isle Beach in Brunswick County, North Carolina. March 2001 - November 2001. Report for the U.S. Army Corps of Engineers, Wilmington District, Wilmington, NC. Various paginations.
- CZR, Inc. 2002b. Waterbird and Shorebird Use of Beaches in Brunswick County, North Carolina. December 2000 - November 2001. Report for the U.S. Army Corps of Engineers, Wilmington District, Wilmington, NC. Various paginations.
- Dahl, T.E. 2000. *Status and Trends of Wetlands in the Conterminous United States 1986 to 1997*. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 82 p.
- Diaz, H. 1980. The mole crab *Emerita talpoida* (say): A case study of changing life history pattern: *Ecological Monographs* 50(4):437-456.
- Donoghue, C. R. 1999. The influence of swash processes on *Donax variabilis* and *Emerita talpoida*. PhD. Dissertation, Univ. of Virginia. Department of Environmental Sciences. 197 p.
- Duncan, W.H., and M.B. Duncan. 1987. *The Smithsonian Guide to Seaside Plants of the Gulf and Atlantic Coasts from Louisiana to Massachusetts, Exclusive of Lower Peninsular Florida*. Washington, D.C.: Smithsonian Institution Press. 409 p.
- Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. *The Birder's Handbook: A Field Guide to the Natural History of North American Birds*. New York: Simon & Schuster, Inc. 785 p.
- Environmental Protection Agency (EPA). 2001. *Final Environmental Impact Statement for the New Wilmington Ocean Dredged Material Disposal Site Designation*. Atlanta, Georgia. Various paginations.
- Epperly, S. P., J. Braun, and V. Veishlow. 1995. Sea turtles in North Carolina waters. *Conservation Biology*. 9:384-394.
- Ernest, R.G. 2001. The Effects of Beach Nourishment on Sea Turtle Nesting and Reproductive

- Success, a Case Study on Hutchinson Island, Florida. *Proceedings of the Coastal Ecosystems and Federal Activities Technical Training Symposium*, August 20-22, 2001, Gulf Shores, Alabama. U.S. Fish and Wildlife Service, CD-ROM.
- Erwin, R.M., B.R. Truitt, and J.E. Jimenez. 2001. Ground-nesting waterbirds and mammalian carnivores in the Virginia barrier island region: running out of options. *Journal of Coastal Research*, 17(2):292-296.
- Everhart, S.H., R.F. Soots, Jr., J.F. Parnell, and P.D. Doerr. 1980. *Natural and Dredged Material Nesting Habitats of Gull-billed Terns, Common Terns and Black Skimmers in North Carolina*. University of North Carolina Sea Grant Publication UNC-SG-79-05. 39 p. + appendices.
- Eversole, A.G. 1987. *Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (South Atlantic): Hard Clam*. U.S. Fish and Wildlife Service Biol. Rep. 82(11.75). U.S. Army Corps of Engineers TR EL-82-4. 33 p.
- Facey, D.E., and M.J. Van Den Avyle. 1986. *Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (South Atlantic): American Shad*. U.S. Fish and Wildlife Service Biol. Rep. 82(11.45). U.S. Army Corps of Engineers TR EL-82-4. 18 p.
- Fay, C.W., R.J. Neves, and G.B. Pardue. 1983a. *Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Mid-Atlantic): Bay Scallop*. U.S. Fish and Wildlife Service, Division of Biological Services, FWS/OBS-82/11.12. U.S. Army Corps of Engineers TR EL-82-4. 17 p.
- Fay, C.W., R.J. Neves, and G.B. Pardue. 1983b. *Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Mid-Atlantic): Surf Clam*. U.S. Fish and Wildlife Service, Division of Biological Services, FWS/OBS-82/11.13. U.S. Army Corps of Engineers TR EL-82-4. 23 p.
- Flint, K.L. 1988. *Bogue Banks, North Carolina: An analysis of the land use and cover changes from 1939 to 1983*. Master's Thesis, Department of Geography and Planning, East Carolina University. 132 p.
- Fonseca, M.S., W.J. Kenworthy, and G.W. Thayer. 1998. *Guidelines for the Conservation and Restoration of Seagrasses in the United States and Adjacent Waters*. NOAA Coastal Ocean Program Decision Analysis Series No. 12. NOAA Coastal Ocean Office, Silver Spring, MD. 222 p.
- Fraser, J. 2001. Moist soil habitats for piping plovers. *Proceedings of the Coastal Ecosystems and Federal Activities Technical Training Symposium*, August 20-22, 2001, Gulf Shores, Alabama. U.S. Fish and Wildlife Service, CD-ROM.

- Fussell, J.O., III. 1985. *Finding Birds in Carteret County*. 96 p.
- Fussell, J.O., III. 1994. *A Birder's Guide to Coastal North Carolina*. Chapel Hill, NC: The University of North Carolina Press. 540pp.
- GMCO. 2001. *Waterproof Chartbook of North Carolina from Back Bay, Virginia, to Little River, South Carolina*. Springfield, VA. 120 p.
- Graetz, K.E. 1994. *Seacoast Plants of the Carolinas for Conservation and Beautification*. 7<sup>th</sup> edition. Raleigh, NC: University of North Carolina Sea Grant Publication UNC-SG-73-06. 206 p.
- Hackney, C. T., M. R. Posey, S. W. Ross, and A. R. Norris. (eds.). 1996. *A Review and Synthesis of Data on Surf Zone Fishes and Invertebrates in the South Atlantic Bight and the Potential Impact from Beach Renourishment*. Report to the Wilmington District, U. S. Army Corps of Engineer. Wilmington, North Carolina. 109 pp.
- Hales, L.S., and M.J. Van Den Avyle. 1989. *Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (South Atlantic): Spot*. U.S. Fish and Wildlife Service Biol. Rep. 82(11.91). U.S. Army Corps of Engineers TR EL-82-4. 24 p.
- Hefner, J.M., B.O. Willen, T.E. Dahl and W.E. Frayer. 1994. *Southeast Wetlands: Status and Trends, Mid-1970's to Mid-1980's*. U.S. Department of the Interior, Fish and Wildlife Service, Atlanta, GA. 32 p.
- Hine, A.C., and S.W. Snyder. 1985. Coastal lithosome preservation: Evidence from the shoreface and inner continental shelf off Bogue Banks, North Carolina. *Marine Geology* 63:307-330.
- Hobbs, C.H., III. 2002. An investigation of potential consequences of marine mining in shallow water: An example from the Mid-Atlantic coast of the United States. *Journal of Coastal Research* 18(1):94-101.
- Hunter, W.C. 2001. *Southeastern Coastal Plains – Caribbean Regional Shorebird Plan*, Version 1.0. U.S. Fish and Wildlife Service, Atlanta, GA. 53 p.
- Hunter, W.C., L. Peoples, and J. Collazo. 2001. *Partners in Flight Bird Conservation Plan for the South Atlantic Coastal Plain*. American Bird Conservancy, Atlanta, GA. 166 p.
- Jackson, N. 2001. Suitability of Sandy Beach Foreshores as Habitat: Examples from Two Estuaries. *Proceedings of the Coastal Ecosystems and Federal Activities Technical Training Symposium*, August 20-22, 2001, Gulf Shores, Alabama. U.S. Fish and Wildlife Service, CD-ROM.
- Kenny, A.J., and H.L. Rees. 1993. Preliminary results on the effects of marine gravel extraction

- on benthos: post-dredging recolonization. ICES Report, Annex VIII.
- Kenny, A.J., and H.L. Rees. 1994. The effects of marine gravel extraction on the macrobenthos: early post-dredging recolonization. *Marine Pollution Bulletin*, 28(7):442-447.
- Knott, D.M., D.R. Calder and R.F. Van Dolah, 1983. Macrobenthos of Sandy Beach and Nearshore Environments at Murrells Inlet, South Carolina, USA: *Estuarine, Coastal and Shelf Science*, 16:573-590.
- Kushlan, J., and M. Steinkamp (eds). 2001. *Review Draft II – North America Waterbird Conservation Plan, Volume One: Seabirds and Colonial Waterbirds*, 23 October 2001, Waterbird Conservation Plan Steering Committee, Washington, D.C. ([www.nacwcp.org/](http://www.nacwcp.org/)). Various paginations.
- Laney, R.W., D.J. Newcomb, and C.M. Manooch III. 2001. Potential impacts of beach nourishment on migratory striped bass off the North Carolina Outer Banks. *Proceedings of the Coastal Ecosystems and Federal Activities Technical Training Symposium*, August 20-22, 2001, Gulf Shores, Alabama. U.S. Fish and Wildlife Service, CD-ROM.
- Larson, S.C., M.J. Van Den Avyle, and E.L. Bozeman, Jr. 1989. *Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (South Atlantic): Brown Shrimp*. U.S. Fish and Wildlife Service Biol. Rep. 82(11.90). U.S. Army Corps of Engineers TR EL-82-4. 14 p.
- LeGrand, H.E., Jr., and S.P. Hall. 1999. *Natural Heritage Program List of the Rare Animal Species of North Carolina*. Raleigh, NC: North Carolina Natural Heritage Program, Division of Parks and Recreation, Department of Environment and Natural Resources. 98 p.
- Lindquist, N., and L. Manning, 2001. *Impacts of Beach Nourishment and Beach Scraping on Critical Habitat and Productivity of Surf Fishes*. Final Report to the NC Fisheries Resource Grant Program. 41 p. + appendices.
- MacKenzie, C., L.S. Weiss-Glanz, and J.R. Moring. 1985. *Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Mid-Atlantic): American Shad*. U.S. Fish and Wildlife Service Biol. Rep. 82(11.37). U.S. Army Corps of Engineers TR EL-82-4. 18 p.
- Mallette, P.M. 1986. Lithostratigraphic analysis of cyclical phosphorite sedimentation within the Miocene Pungo River Formation, North Carolina continental shelf. Master's Thesis, Department of Geology, East Carolina University. 155 p.
- Martof, B.S., W.M. Palmer, J.R. Bailey, and J.R. Harrison. 1980. *Amphibians and Reptiles of the Carolinas and Virginia*. The University of North Carolina Press. Chapel Hill, North Carolina. 264pp.

- McArdle, S.B. and A. McLachlan. 1992. Sand beach ecology: Swash features relevant to the macrofauna: *Journal of Coastal Research* 8(2):398-407.
- McLachlan, A. 1990. Dissipative beaches and macrofauna communities on exposed intertidal sands. *Journal of Coastal Research*, v. 6, pp. 57-71. (As cited in McArdle and McLachlan 1992)
- McLachlan, A., I.G. Eliot and D.J. Clarke. 1985. Water filtration through reflective microtidal beaches and shallow sublittoral sands and its implications for an inshore ecosystem in Western Australia: *Estuarine, Coastal and Shelf Science*, v. 21, pp. 91-104.
- McLachlan, A., E. Jaramillo, O. Defeo, J. Dugan, A. de Ruyck and P. Coetzee. 1995. Adaptations of bivalves to different beach types: *Journal of Experimental Marine Biology and Ecology*, v. 187, pp. 147-160.
- Meadows, P.S., and J. Tait. 1989. Modification of sediment permeability and shear strength by two burrowing invertebrates: *Marine Biology*, v. 101, pp. 75-82.
- Meyer, P. 1994. *Nature Guide to the Carolina Coast: Common Birds, Crabs, Shells, Fish and other Entities of the Coastal Environment*. Wilmington, NC: Avian-Cetacean Press. 148 p.
- Moffatt and Nichol Engineers. 2000. *Town of Emerald Isle, North Carolina: Engineering Analysis for the FEMA Stormwater Hazard Mitigation Application – Coast Guard Road Area*. Report to the Town of Emerald Isle. 117 p. + appendices.
- Moslow, T.F., and S.D. Heron, Jr. 1994. The Outer Banks of North Carolina. Chapter 2 in R. A. Davis (ed), *Geology of Holocene Barrier Island Systems*. Berlin, Germany: Springer-Verlag, pp. 47-74.
- Muncy, R.J. 1984. *Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (South Atlantic): White Shrimp*. U.S. Fish and Wildlife Service Biol. Rep. 82(11.27). U.S. Army Corps of Engineers TR EL-82-4. 19 p.
- Murphy, M.A. 2002. *Estuarine Shoreline Erosion, Albemarle-Pamlico Sound, North Carolina*. Master's Thesis, Department of Geology, East Carolina University. 295 p.
- National Marine Fisheries Service (NMFS). 1999. *Marine Recreational Fisheries Statistics Survey (MRFSS): South Atlantic*. Washington, D.C. 12 p.
- National Oceanic and Atmospheric Association (NOAA). 2002. Southeastern Submerged Aquatic Vegetation (SAV), Geographic Information System (GIS) digital data. Beaufort, NC. CD-ROM.
- North Carolina Division of Coastal Management (NC DCM). 1992. Long-term Average



- Shoreline Change Rates Updated Through 1992. Raleigh, NC: North Carolina Department of Environment and Natural Resources. 17 p.
- Nordstrom, K.F. 1990. The intrinsic value of depositional coastal landforms. *Geographical Review* 80:68-81.
- Nordstrom, K. F. 1994. "Developed coasts." Chapter 13 in R. W. G. Carter and C. D. Wooddroffe. (eds.) *Coastal Evolution - Late Quaternary Shoreline Morphodynamics*. Cambridge, United Kingdom: Cambridge University Press, pp. 477-509.
- Nordstrom, K.F. 2000. *Beaches and Dunes of Developed Coasts*. Cambridge, United Kingdom: Cambridge University Press. (As cited in Nordstrom 2001)
- Nordstrom, K.F. 2001. Opportunities and constraints to restoring naturally-functioning landforms and biota on intensively-developed barrier islands. *Proceedings of the Coastal Ecosystems and Federal Activities Technical Training Symposium*, August 20-22, 2001, Gulf Shores, Alabama. U.S. Fish and Wildlife Service, CD-ROM.
- Oliver, J.D., M.J. Van Den Avyle, and E.L. Bozeman, Jr. 1989. *Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (South Atlantic): Bluefish*. U.S. Fish and Wildlife Service Biol. Rep. 82(11.96). U.S. Army Corps of Engineers TR EL-82-4. 13 p.
- Peters, D.S., L.R. Settle and J.D. Fuss. 1995. "Larval fish abundance in vicinity of Beaufort Inlet prior to berm construction." Progress Report submitted to the U.S. Army Corps of Engineers, Wilmington District. 21 p.
- Peterson, R.T. 1980. *A Field Guide to the Birds of Eastern and Central North America*. Boston: Houghton Mifflin Company. 384 p.
- Peterson, C.H., D. H. M. Hickerson, and G. G. Johnson. 2000. Short-term consequences of nourishment and bulldozing on the dominant large invertebrates of a sandy beach. *Journal of Coastal Research*. 16:368-378.
- Peterson, C.H., and L.M. Manning. 2001. How beach nourishment affects the habitat value of intertidal beach prey for surf fish and shorebirds and why uncertainty still exists. *Proceedings of the Coastal Ecosystems and Federal Activities Technical Training Symposium*, August 20-22, 2001, Gulf Shores, Alabama. U.S. Fish and Wildlife Service, CD-ROM.
- Peterson, C.H., and J.T. Wells. 2000. *Bogue Banks Beach Renourishment Project: Late Fall 1999 Assessment of Benthic Invertebrate and Demersal Fish Resources in the Offshore Mining Sites Prior to Sand Mining*. Final Report to Carteret County and CSE Baird, Inc. (As included in CSE and Stroud 2000). 55 p. + appendices.

- Pilkey, O.H., Jr., O.H. Pilkey, Sr., and R. Turner. 1975. *How to live with an island: A handbook to Bogue Banks, North Carolina*. Raleigh, NC: North Carolina Department of Natural and Economic Resources. 119 p.
- \_\_\_\_\_, W.J. Neal, S.R. Riggs, C.A. Webb, D.M. Bush, D.F. Pilkey, J. Bullock, and B.A. Cowan. 1998. *The North Carolina Shore and Its Barrier Islands: Restless Ribbons of Sand*. Durham, NC: Duke University Press, 318 p.
- Posey, M. 2001. Effects of sediment removal on an offshore benthic community. *Proceedings of the Coastal Ecosystems and Federal Activities Technical Training Symposium*, August 20-22, 2001, Gulf Shores, Alabama. U.S. Fish and Wildlife Service, CD-ROM.
- Posey, M.H., and T.D. Alphin. 2000. *Monitoring of Benthic Faunal Responses to Sediment Removal Associated with the Carolina Beach and Vicinity - Area South Project*. Final Report. University of North Carolina at Wilmington, CMS Report No. 01-01. 18 p. + appendices.
- Posey, M.H., and T.D. Alphin. 2002. Resilience and stability in an offshore benthic community: Responses to sediment borrow activities and hurricane disturbance. *Journal of Coastal Research* 18(4):685-697.
- Psuty, N.P. 1986. Impacts of impending sea-level rise scenarios: the New Jersey barrier island responses. *Bulletin of the New Jersey Academy of Sciences*, 31:29-36. (As cited in Nordstrom 1994).
- Rakocinski, C.F. 2001. Responses by macrobenthic assemblages to extensive beach restoration at Perdido Key, Florida. *Proceedings of the Coastal Ecosystems and Federal Activities Technical Training Symposium*, August 20-22, 2001, Gulf Shores, Alabama. U.S. Fish and Wildlife Service, CD-ROM.
- Rakocinski, C.F., R.W. Heard, S.E. LeCroy, J.A. McLelland, and T. Simons. 1996. Responses by Macrobenthic Assemblages to Extensive Beach Restoration at Perdido Key, Florida, USA. *Journal of Coastal Research*. 12(1):326-353.
- Ray, G.L. 2001. Responses of benthic invertebrate assemblages to the Asbury-Manasquan Inlet beach nourishment project, northern New Jersey. *Proceedings of the Coastal Ecosystems and Federal Activities Technical Training Symposium*, August 20-22, 2001, Gulf Shores, Alabama. U.S. Fish and Wildlife Service, CD-ROM.
- Ray, G.L. and D. Clarke. 1999. The New York District's Biological Monitoring Program for the Atlantic Coast of New Jersey, Asbury Park to Manasquan Section Beach Erosion Control Project. Phases II-III, During Construction and 1<sup>st</sup> Year Post-Construction Studies. Vicksburg, MS: Waterways Experiment Station, various paginations.
- Reed, A.J., and J.T. Wells. 2000. Sediment distribution patterns offshore of a renourished

- beach: Atlantic Beach and Fort Macon, North Carolina: *Journal of Coastal Research* 16(1):88-98.
- Reilly, F.J. Jr., and V.J. Bellis. 1978. A study of the ecological impact of beach nourishment with dredged materials on the intertidal zone. East Carolina University Institute for Coastal and Marine Resources, Technical Report No. 4., Greenville, North Carolina. 107 pp.
- Reilly, F.J., D.M. Landy Cobb and V.J. Bellis. 1980. Biological Implications of Beach Replenishment: in N.P. Psuty and D. McArthur, eds, "Utilization of science in the decision-making process," *Proceedings of the Sixth Annual Conference of The Coastal Society*, pp. 269-280.
- Richardson, W.J., C.R. Greene, Jr., C.I. Malme, and D.H. Thomson. 1995. *Marine Mammals and Noise*. San Diego: Academic Press, 576 p.
- Riggs, S.R. 2002. *Shoreline Erosion in North Carolina Estuaries*. Part 1 of The Soundfront Series by North Carolina Sea Grant, Publication UNC-SG-01-11, 68 p.
- \_\_\_\_\_, W.J. Cleary, and S.W. Snyder. 1995. Influence of inherited geologic framework on barrier shoreface morphology and dynamics: *Marine Geology* 126(1995): 213-234.
- \_\_\_\_\_, S.W. Snyder, A.C. Hine and D.L. Mearns. 1996. Hardbottom morphology and relationship to the geologic framework: Mid-Atlantic continental shelf. *Journal of Sedimentary Research*. 66(4):830-846.
- \_\_\_\_\_, W.G. Ambrose Jr., J.W. Cook, Scott W. Snyder, and Stephen W. Snyder. 1998. Sediment production on sediment-starved continental margins: The interrelationship between hardbottoms, sedimentological and benthic community processes, and storm dynamics. *Journal of Sedimentary Research*. 68(1):155-168.
- Robins, C. R. and G. C. Ray. 1986. *A Field Guide to Atlantic Coast Fishes*. The Peterson Field Guide Series. Houghton Mifflin Company, New York. 354pp.
- Rodgers, J.A., Jr., and H.T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. *Conservation Biology*, 9(1):89-99.
- Roessler, R.S., and J.T. Wells. 2001. Beach changes along eastern Bogue Banks, North Carolina, resulting from the 1996 hurricane season. *Journal of Coastal Research* 17(4):964-975.
- Rogers, S.G., and M.J. Van Den Avyle. 1983. *Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (South Atlantic): Atlantic Menhaden*. U.S. Fish and Wildlife Service Biol. Rep. 82(11.11). U.S. Army Corps of Engineers TR EL-82-4. 20 p.

- Rogers, S.G., and M.J. Van Den Avyle. 1989. *Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Mid-Atlantic): Atlantic Menhaden*. U.S. Fish and Wildlife Service Biol. Rep. 82(11.108). U.S. Army Corps of Engineers TR EL-82-4. 23 p.
- Root, T. 1988. *Atlas of Wintering North American Birds: An Analysis of Christmas Bird Count Data*. Chicago: University of Chicago Press. 312 p.
- Ruppert, E.E., and R.S. Fox. 1988. *Seashore Animals of the Southeast: A Guide to Common Shallow-water Invertebrates of the Southeastern Atlantic Coast*. Columbia, SC: University of South Carolina Press. 429 p.
- Saloman, C.H. and S.P. Naughton. 1984. *Beach restoration with offshore dredged sand: effects on nearshore macrofauna*. U.S. Dept. of Commerce, National Oceanic and Atmospheric Association, NOAA Tech. Memorandum NMFS-SEFC-133. 20 pp.
- Saloman, C.H., S. P. Naughton, and J. L. Taylor. 1982. *Benthic community response to dredging borrow pits, Panama City Beach, Florida*. Miscellaneous Report No. 82-3. Prepared for the U. S. Army Corps of Engineers, Coastal Engineering Research Center, Fort Belvoir, Va.
- Shafale, M.P., and A.S. Weakley. 1990. *Classification of the Natural Communities of North Carolina: Third Approximation*. Raleigh, NC: North Carolina Natural Heritage Program, Division of Parks and Recreation, Department of Environment, Health and Natural Resources. 268 p.
- Sibley, D.A. 2000. *The Sibley Guide to Birds*. National Audubon Society. New York: Alfred A. Knopf, Inc. 545 p.
- Smith, D.R., P.S. Pooler, R.E. Loveland, M.L. Botton, S.F. Michels, R.G. Weber, and D.B. Carter. 2002. Horseshoe crab (*Limulus polyphemus*) reproductive activity on Delaware Bay beaches: Interactions with beach characteristics. *Journal of Coastal Research* 18(4):730-740.
- Snyder, R.A., and C.L. Boss. 2002. Recovery and stability in barrier island plant communities. *Journal of Coastal Research* 18(3):530-536.
- Stanczuk, D.T. 1975. *Effects of development on barrier island evolution, Bogue Banks, North Carolina*. Master's Thesis, Department of Geology, Duke University. 126 p.
- Steele, G.A. 1980. *Stratigraphy and depositional history of Bogue Banks, North Carolina*. Master's Thesis, Department of Geology, Duke University. 201 p.
- Steinitz, M.J., M. Salmon and J. Wyneken. 1998. Beach Renourishment and Loggerhead Turtle Reproduction: A Seven Year Study at Jupiter Island, Florida: *Journal of Coastal*

*Research*, 14(3):1000-1013.

Swales, A. 2002. Geostastical estimation of short-term changes in beach morphology and sand budget. *Journal of Coastal Research* 18(2):338-351.

Terry, R.D., and G.V. Chilingar. 1955. Summary of "Concerning additional aids in studying sedimentary formations," by M.S. Shvetsov. *Journal of Sedimentary Petrology*, 25:229-234.

Thieler, E. R., A. L. Brill, W. J. Cleary, C. H. Hobbs III, and R. A. Gammisch. 1995. Geology of the Wrightsville Beach, North Carolina shoreface: Implications for the concept of shoreface profile of equilibrium. *Marine Geology*. 126:271-287.

Tiner, R. W. 1993. *Field Guide to Coastal Wetland Plants of the Southeastern United States*. The University of Massachusetts Press. Amherst, Massachusetts. 328 pp.

Titus, J.G. 1990. Greenhouse effect, sea level rise, and barrier islands: Case study of Long Beach Island, New Jersey. *Coastal Management*, 18:65-90.

Turgeon, D.D., A.E. Bogan, E.V. Coan, W.K. Emerson, W.G. Lyons, W.L. Pratt, C.F.E. Roper, A. Scheltema, F.G. Thompson, and J.D. Williams. 1988. *Common and Scientific Names of Aquatic Invertebrates from the United States and Canada: Mollusks*. American Fisheries Society Special Publication 16, Bethesda, MD. 277 p.

U.S. Army Corps of Engineers (USACE). 2000 (September). *Final Feasibility Report and Environmental Impact Statement on Hurricane Protection and Beach Erosion Control. Dare County Beaches (Bodie Island Portion), Dare County, North Carolina*. Volume I. (Draft Feasibility Report, 99 pp. + plates + appendices and Final EIS, 11 chapters + attachments), Wilmington Corps District, Wilmington, North Carolina.

\_\_\_\_\_. 2001. *The New York District's Biological Monitoring Program for the Atlantic Coast of New Jersey, Asbury Park to Manasquan Section Beach Erosion Control Project. Final Report*. USACE New York District, Engineer Research and Development Center, DynTel Corporation and B.A. Vittor and Associates. Various paginations.

U.S. Fish and Wildlife Service. January 23, 1981. U.S. Fish and Wildlife Service Mitigation Policy. *Federal Register*, v. 46, n. 15, pp. 7644-7663.

\_\_\_\_\_. 1999 (July). *Northern Dare County Storm Damage Reduction Project (Bodie Island Portion), Dare County, North Carolina. Draft Fish and Wildlife Coordination Act Report*. Raleigh Ecological Services Field Office, Raleigh, NC. 173 p. + Appendices.

\_\_\_\_\_. 2000a (August). *Brunswick County Storm Damage Reduction Project, Oak Island and Holden Beach, North Carolina. Draft Fish and Wildlife Coordination Act Report*. Raleigh Ecological Services Field Office, Raleigh, NC. 175 p. + appendices.

- \_\_\_\_\_. 2000b (April). *Wilmington Harbor, North Carolina, 96 Act, New Hanover and Brunswick Counties, North Carolina. Supplement to the Final Fish and Wildlife Coordination Act Report*. Raleigh Ecological Services Field Office, Raleigh, NC. 74 p. + appendices.
- \_\_\_\_\_. 2001 (January). *Northern Dare County Storm Damage Reduction Project (Bodie Island Portion), Dare County, North Carolina. Final Fish and Wildlife Coordination Act Report*. Raleigh Ecological Services Field Office, Raleigh, NC. 16 p. + appendices.
- \_\_\_\_\_. 2002a (February). *Bogue Banks Shore Protection Project, Carteret County, North Carolina. Planning Aid Report*. Raleigh Ecological Service Field Office, Raleigh, NC. 58 p.
- \_\_\_\_\_. 2002b. *Waterfowl population status, 2002*. U.S. Department of the Interior, Washington, D.C. 51pp.
- U.S. Minerals Management Service (MMS). 1999. *Environmental Report – Use of Federal Offshore Sand Sources for Beach and Coastal Restoration in New Jersey, Maryland, Delaware, and Virginia*. OCS Study MMS 99-0036. Office of International Activities and Marine Minerals. Prepared by The Louis Berger Group, Inc., Contract Number 1435-01-98-RC-30820. Various paginations.
- \_\_\_\_\_. 2001. *Final Report: Development and Design of Biological and Physical Monitoring Protocols to Evaluate the Long-term Impacts of Offshore Dredging Operations on the Marine Environment*. OCS Study MMS 2001-089. 116 pages + appendices.
- Van Den Avyle, M.J., and D.L. Fowler. 1984. *Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (South Atlantic): Blue Crab*. U.S. Fish and Wildlife Service Biol. Rep. 82(11.19). U.S. Army Corps of Engineers TR EL-82-4. 16 p.
- Van Dolah, R.F., P. H. Wendt, R. M. Martore, M. V. Levisen, W. A. Roumillat. 1992. A physical and biological monitoring study of the Hilton Head beach nourishment project. Marine Resources Research Institute, South Carolina Marine Resources Division, Charleston, S.C. 159 pp.
- Van Dolah, R. F., Martore, R. M., Lynch, A. E., Wendt, P. H., Levisen, M. V., Whitaker, D. J., and W. D. Anderson. 1994. Final Report. Environmental evaluation of the Folly Beach nourishment project. South Carolina Department of Natural Resources, Marine Resources Division, Charleston SC. Prepared for the United States Army Corps of Engineers, Charleston District, Charleston, SC.

- Webster, W.D., J.F. Parnell, W.C. Biggs, Jr. 1985. *Mammals of the Carolinas, Virginia, and Maryland*. The University of North Carolina Press, Chapel Hill. 255 pp.
- Wilber, D. 2001. Responses of fish assemblages to the Asbury-Manasquan Inlet beach nourishment project, northern New Jersey. *Proceedings of the Coastal Ecosystems and Federal Activities Technical Training Symposium*, August 20-22, 2001, Gulf Shores, Alabama. U.S. Fish and Wildlife Service, CD-ROM.
- Wilkins, K.A., and M.C. Otto. 2002. *Trends in Duck Breeding Populations, 1955-2002*. Administrative Report of the U.S. Fish and Wildlife Service, Laurel, MD. 19 p.
- Williams, A.B., L.G. Abele, D.L. Felder, H.H. Hobbs, Jr., R.B. Manning, P.A. McLaughlin, and I.P. Farfante. 1989. *Common and Scientific Names of Aquatic Invertebrates from the United States and Canada: Decapod Crustaceans*. American Fisheries Society Special Publication 17, Bethesda, MD. 77 p.
- Wilson, L.A. 1995. *Land Manager's Guide to the Amphibians and Reptiles of the South*. The Nature Conservancy, Southeastern Region, Chapel Hill, NC. 360 p.
- Wolcott, T.G. 1978. Ecological role of ghost crab, *Ocypode quadrata* (Fabricius) on an ocean beach: scavenger or predators? *Journal of Experimental Marine Biology and Ecology* 31:67-82.